small, each half bulging, convex; a V-shaped median notch; outer pleural appendage flattened, elongate, tapering gradually to the apex, the outer face with numerous hairs of moderate length. Ninth sternite deeply notched.

Habitat: Kamchatka.

Holotype, ♂, Kamchatka (L. Stejneger).

A REVIEW OF THE GENUS BUPRESTIS IN NORTH AMERICA.

By Alan S. Nicolay and Harry B. Weiss.[1]

New Brunswick, N. J.

The genus *Buprestis,* which contains some of the most beautiful and rarest beetles of our fauna, was very much neglected by the early coleopterists. Since Le Conte's revision of the family in 1859, there was no serious attempt made at classification until 1909, when Colonel Thomas L. Casey made an exhaustive study of the genus. The result of this was a multitude of new species, the validity of most of which may be justly questioned by students who demand at least one good, constant character. Common and well known species were split in such a way as to cause one to wonder whether a species was erected on an evident character or on the geographical limits of a state. No one will deny that there is considerable variation in all of these large, brightly colored forms and it has been demonstrated that the amount of food available to the larva influences the development and size of the adult. Mr. W. J. Chamberlin, who has carried on extensive experiments in the breeding of various buprestids, has secured from one female of *Buprestis aurulenta,* a series of forms ranging from entirely green to a uniform bronze. Owing to floods, commerce, etc., infested wood is constantly being distributed over the country. These taken together with the fact that the adults are strong fliers make it absurd to limit each species to a certain restricted area.

Colonel Casey's work has been of considerable value to students of the Buprestidæ, as it was the first careful treatise of the group and on account of the many new facts and painstaking descriptions of the species. On the other hand, we feel that there is no good founda-

[1] The arrangement of the authors' names is alphabetical.

tion for the many new species and sub-species described and have taken the liberty of placing his forms in synonymy when no good character could be found to warrant the erection of a species or interpolation of a new name.

"The Buprestis of the ancients, as its name signifies in Greek, was a poisonous insect which being swallowed with grass by grazing cattle, produced a violent inflammation, and such a degree of swelling as to cause the cattle to burst" (Harris). Linnæus applied this name to the family in spite of the fact that none of its members is poisonous and they are rarely if ever taken on grass. The name "burn-cow" has been applied to them by certain English writers, and the French named them "richards" on account of the brilliancy and richness of their colors. The native chieftains in South America evidently admired the colors of some species of Buprestidæ, inasmuch as the elytra of *Euchroma gigantea* were used by them as leg ornaments, a large number being strung so as to form a circlet (Sharp).

In Europe, some species of wasps are known to store their nests with Buprestidæ. Dufour unearthed in a single field, thirty nests of *Cerceris buprestícida* which were filled with several species of *Buprestis*[2] comprising 400 individuals and none of any other genus (Packard). In a fascinating account of the habits of *Cerceris buprestícida,* Fabre quoting Dufour mentions *Buprestis octogutta, B. tarda, B. bifasciata, B. pruni, B. biguttata, B. micans. B. flavomaculata, B. chrysostigma, B. novem-maculata* as being dug from the cells of this wasp and states that the cleanliness and freshness of the beetles which she buries testify that they are seized just as they emerge from their wooden galleries.

In fossil forms, the family Buprestidæ is rich, no less than 28 per cent. of the Mesozoic beetles found by Heer in Switzerland being referred to this family (Sharp). In Scudder's "Fossil Insects of North America," three Tertiary species of *Buprestis* are mentioned, *Buprestis tertiaria* Scudd., *B. saxigena* Scudd., and *B. sepulta* Scudd., from "Nicola River, below main coal seam, British Columbia," all being represented of course by elytra or fragments of elytra. Scudder states that all "agree closely together but do not seem to be plainly referable to any recent American genus, although approaching nearest *Buprestis*" and that "they seem to be nearly related also to the

[2] Certain species mentioned by Dufour have since been placed in closely related genera and a few in synonymy.

Tertiary species from Sieblos described by Heyden under the name of *B. senecta*." Wickham (Bull. Mus. Comp. Zoöl., vol. LVIII, no. 11) describes two Miocene species from Florissant, Col., *B. florissantensis* and *B. scudderi*.

According to Kerremans, the genus *Buprestis* contains 51 species, scattered over all of the northern hemisphere. Temperate Europe, Siberia, and the United States furnish a large number and two species

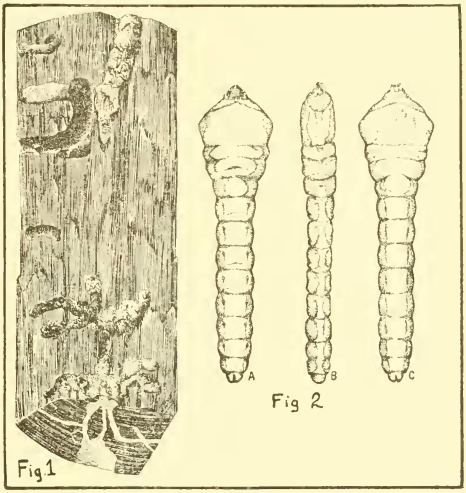

Fig 1. Work of *Buprestis apricans* in long leaf pine wood (reduced). (After H. E. Burke in U. S. Dept. Agric. Yearbook, 1909.)

Fig. 2. *Buprestis apricans* larva. *A*, dorsal view; *B*, dextral view; *C*, ventral view. (After H. E. Burke in Bull. 437, U. S. Dept. Agric. Bur. Ent.)

extend as far south as the equator. In their catalog of "The Coleoptera of Europe" (1906), Heyden, Reitter and Weise list 13 species, 6 varieties and 7 aberrations and Wollaston in his "Coleoptera Atlantidum" lists one species (*B. bertheloti*) from the Madeiras, Salvages and Canaries, this being exceedingly rare. Several specimens were taken in spider webs in the remote island of Hierro of the Canary Group. There is no representative of the genus in Great Britain.

The larvæ of the Buprestidæ are miners in the tissue of dead, dying and living plants, and on account of the enlarged and flattened prothoracic segment which is common to one type, they have received the names, "flat-headed borers" and "hammer heads." Some live in decaying wood, while others infest orchard and other trees and are of economic importance. Their work in general consists of a "flattened oval, gradually enlarging, more or less tortuously winding mine or wormhole, which when completed widens out into an elongate oval pupal cell. This cell connects with the outer surface by a short, oval exit hole. The mine has its surface marked by fine, transverse, crescentic lines and is usually tightly packed with sawdust-like borings and pellets of woody excrement. The injury may be entirely in the bark, entirely in the wood, or as is usually the case, in both bark and wood" (Burke). These mines may completely encircle the trunk and when this occurs, the circulation of sap is stopped and the tree dies. According to Burke, who has added much to our knowledge of the life history and habits of these insects, the life history in general is as follows.

Eggs are deposited singly during the spring or summer, in crevices in the bark or under the bark at the edge of a wound and the larva mines the inner bark or wood until it reaches maturity, which may be the following or second fall. It then forms a cell in the bark or wood in which it pupates and transforms to the adult. The winter is passed in the larval, pupal or adult stage, and in nearly all cases the adult emerges the following spring or summer. The beetles usually feed on the foliage of some plant, sometimes on that of the host, but often on that of another. After mating and egglaying, death soon takes place. The beetles are active, fly readily and like to bask in the sunshine. According to Fletcher, a specimen of *B. aurulenta* was found in the act of emerging from its burrow in the wood of a desk which had stood in the Office of Works at Guildhall for twenty-two years.

There are two general types of buprestid larvæ, one, the bark and wood borers, "flat-headed borers" with a long, slender, sub-cylindrical body and the other, leaf miners, with the body flattened, rather oval, deeply notched and gradually tapering to the last segment. According to Burke, both types are distinguished by the following characters. Body composed of thirteen flattened segments. Head small

and more or less retracted into the first segment. Antennæ medium sized, three-jointed; ocelli lacking; labrum large, arched and protruded; mandibles short and strong, usually toothed and rather spoon shaped; maxillæ well developed; maxillary palpi two jointed; labium well developed arched, protruded; labial palpi minute and unsegmented, almost obsolete. First segment with large well developed plate on both ventral and dorsal surfaces; legs absent, ambulatory tubercles sometimes present; cerci absent; spiracles crescentic, one large one on either side of the second segment and one small one on either side of each of the fourth to eleventh segments on the anterior dorso-lateral surface.

The possession of a well developed ambulatory plate on both dorsal and ventral surfaces of the first segment behind the head is the principal distinguishing character of the buprestid larva. Both plates are alike and the dorsal plate has a central line groove or V. Burke states that similar plates occur on some eucnemid larvæ but that the markings on the dorsal plate consist of two lateral lines; that cerambycid larvæ never have the ventral plate as well developed or similar to the dorsal one and that cucujid larvæ are very flat and possess well-developed legs. In Burke's table for separating the genera, the following larval characters of the genus *Buprestis* are given. Larva somewhat flattened, club-like in form; first segment distinctly larger and broader than following segment; last segment without a distinct chitinous fork; plates of first segment with distinct chitinous rugosities; rugosities of first segment pointlike; plates with indefinite margins, markings light, appearing more as grooves than as definite lines; dorsal plate marked by a short trunked inverted Y or U, the apex and trunk of which are often faint, rugose area forming more or less of a hood around the Y; ventral plate marked with a median groove that extends from the posterior margin of the plate two-thirds or three-fourths of the distance to the anterior margin, not bisecting the plate. Burke also states that the larval characters strongly indicate that the genus *Buprestis* should be split into three genera.

The family Buprestidæ is represented in our fauna by eight tribes —*Polycestini, Schizopini, Thrincopygini, Chalcophorini, Chrysobothrini, Buprestini, Agrilini* and *Mastogenini*. The tribe *Buprestini* contains those forms having the hind coxæ with plates distinctly dilated

near the base, the mesosternum divided so that the sternal cavity is formed by the meso- and metasternum and the antennal pores inferior in small pits. The genus *Buprestis* may be distinguished by the following characters—mentum pale, membranous in front; mesosternal suture distinct; posterior lateral metathoracic sclerite uncovered, triangular; prosternal spine obtusely rounded at apex and obtusely angulated behind the front coxæ; scutellum small; elytra regularly striate throughout, moderately narrowed posteriorly, usually marked with yellow; medium sized species.

For those forms (*adjecta, sulcicollis, aurulenta, striata*) having the pronotum uniformly impressed along the middle, labrum more chitinous and metallic at its basal part and a complete absence of true elytral striæ, with the substitution of a few longitudinal ribs separated by wide and uniformly punctured intervals, Casey erects the subgenus *Cypriacis* and for those (*decora, salisburyensis, apricans*) with elytra having no vestige of regular discal costæ and but feeble traces of impressed striæ, but in their place a series of large perforate punctures with the general surface closely, deeply and confusedly but evenly crihrate with smaller punctures, while the prothorax seldom has any trace of an impressed line, he has erected the subgenus *Stereosa*. This would divide *Buprestis* into three groups and ratify Burke's conclusion arrived at through the study of the larvæ.

Burke states that the larvæ of *Buprestis* proper "have a small rugose hood around the apex of the V-shaped markings on the dorsal plate of the first segment and very slight rugose markings along the groove on the ventral plate" and that in this group, "pupation takes place in the spring and the beetles emerge soon afterwards." In the subgenus *Cypriacis*, "the rugose hood around the apex of the V is much larger and the rugose area along the ventral marking is broad. Pupation in this group takes place during the summer and the beetles remain in the pupal cells until the following spring." In the subgenus *Stereosa*, "there is no distinct rugose hood around the apex of the V but almost the entire dorsal plate is rugose, as is also the ventral plate. Pupation takes place in the summer and the beetles winter over in the pupal cells."

KEY TO THE SPECIES.

1—Prosternum not or weakly and shortly sulcated, anterior tibiæ of male internally emarginate and armed with a reflexed tooth at apex.....9
Prosternum broadly sulcated, anterior tibiæ of both sexes simple.....2
2—Elytra punctate-striate (Subgenus **Stereosa** Casey).....7
Four or more elytral costæ, suture and margin elevated (Subgenus **Cypriacis** Casey).....3
3—Elytral costæ flat, punctured.....6
Elytral costæ convex, their summits polished and not or very feebly punctate.....4
4—Third of the true elytral costæ very short, costæ feebly punctate. **sulcicollis** Lec.
Third costa long, sutural costa at least impunctate.....5
5—Elytra with four costæ, tips of elytra not bidentate, head with median eosta.....**aurulenta** Linn.
Elytra with eight costæ, tips of elytra sub-bidentate, head with faint median sulcus.....**adjecta** Lec.
6—Above, dark, coppery brown.....**striata** Fab.
Above with more or less green.....var. **impedita** Say
7—Bright green above.....8
Color uniform dull cupreous brown.....**apricans** Hbst.
8—Tips of elytra bidentate, form narrow elongate.....**decora** Fab.
Tips of elytra not bidentate, form short and stout....**salisburyensis** Hbst.
9—First segment of abdomen not sulcated.....19
First segment of abdomen sulcated.....10
10—Elytra with distinct spots or vittæ.....13
Elytra immaculate.....11
11—Elytra strongly furrowed, often with a dull shine.....12
Elytra not strongly furrowed, polished brassy to greenish. **maculativentris** Say
12—Black, often with a dull shine.....var. **rusticorum** Kirby
Elytra and pronotum uniform green to dull green....var. **subornata** Lec.
13—Interstices of elytra alternately convex.....16
Interstices of elytra flat.....14
14—Elytra each with two vittæ more or less confluent and united.....15
Elytra with flavous spots or blotches.....**maculipennis** Gory
15—Vittæ brick-red or fulvous, never or at most but slightly united. **lineata** Fab.
Vittæ flavous, generally united except at humerus and apex. var. **davisi** n. var.
16—Abdomen coarsely punctate, yellow markings of elytra interrupted by striæ, interstices of elytra alternately strongly convex.....17
Abdomen feebly punctate, yellow markings of elytra usually not interrupted by striæ, surface smooth and polished, interstices of elytra alternately feebly convex.....**læviventris** Lec.

17—Sides of thorax sinuate or parallel, often swollen at base.....18
Sides of thorax arcuate .....**nuttalli** Kirby
18—Elytral intervals alternately strongly convex, abdomen coarsely punctate.
var. **alternans** Lec.
Elytral intervals not so strongly convex, abdomen moderately punctate.
var. **consularis** Gory
19—Elytra green to violaceous blue or bronzed; wholly immaculate or marked with distinct spots or vittæ.....20
Elytra green to violaceous blue, entire surface evenly sprinkled with small confluent yellow spots .....**confluenta** Say
20—Legs metallic or black with metallic lustre.....21
Legs wholly or in part pale .....**rufipes** Oliv.
21—Elytra green, bluish, purple or bronzed, immaculate or marked with variable yellow spots 22
Predominating color of elytra fulvous or reddish with suture or a few spots along suture green .....**viridisuturalis** n. sp.
22—Elytra green or bronzed, immaculate or with yellow markings which are never touched with orange 23
Elytra purplish, yellow spot just behind middle and subapical one always touched with orange laterally .....**gibbsi** Le C.
23—Elytra and pronotum uniformly green or bronzed, elytra either immaculate or with variable yellowish markings 24
Elytra greenish, lateral margins and pronotum always a brilliant cupreous.
connexa Horn
24—Elytral striæ moderately deep, intervals broad, without a glossy shine.
fasciata Fab.
Elytral striæ deep, intervals narrow, with a distinct glossy shine.
var. **langi** Mann.

The following brief descriptions deal only with the essential and striking differences and general appearance of the insects and used in connection with the key, should enable one to locate the species with some degree of certainty.

Buprestis aurulenta Linne, 67–661.

lauta (Le Conte), 54–17.
radians (Le Conte), 54–17.
villosa (Le Conte), 73–331.
fabulosa Casey,[3] 09–120.
aemula Casey, 09–121.
tacomæ Casey, 09–121.
nupta Casey, 09–121.
venusta Casey, 09–122.

[3] Described from Mexico, specimens collected by Townsend at Chihuahua.

prospera Casey, 09–122.
affinis Casey, 09–123.
adulans Casey, 09–123.

Elongate, sub-oval. Elytra pale green to ultramarine, suture and lateral margins generally cupreous but absent in extreme forms, feebly inflated sub-posteriorly, tips not bidentate, four elytral costæ, suture and margin elevated, elytral costæ convex, their summits polished and not punctate. Antennæ metallic green or bronzed. Head and pronotum green with more or less bronze at sides, head deeply and confluently punctate with a distinct median costa, pronotum deeply, densely but distinctly punctate, more or less impressed medially. Beneath metallic green or bronzed, prosternum coarsely and densely punctate, abdomen finely punctate. Male slightly narrower than female and having abdomen more elosely punctate, abdomen of female sparingly punctate. Tip of abdomen sub-truncate in both sexes. Length 14–19 mm.

RECORDS.—Yellowstone Park, July 21 (Zabriskie); WYOMING. Divide, Lane County; Ashland; Sulphur Springs, August 2 (Jones); Dilley; Corvallis, May (Green); Ranier, July, August; Coast Mts., April (Chamberlin); OREGON. Priests River, June 21 (Wickham); Atalanta, June, 7800 ft.; IDAHO. UTAH (Barfoot). Santa Fe (Snow); Gallinas Cañon (Snow); Las Vegas (Ward); Las Vegas Hot Springs (Schwarz & Barber); NEW MEXICO. Carrville, Trinity County, July 1 (Van Dyke); San Bernardino Mts., July 3 (May); Camp Nelson, Tulare County, 4700 ft., August 1 (Beardsley); Quincy, July 1 (Radcliffe); Mendocino County; Mt. Lowe, August 8 (Coxey); Tulare County; Sylvania, Huckleberry Meadow, Fresno County, August; McCloud, July 2 (Van Dyke); Yreka (W. Duenkel); CALIFORNIA. NEVADA. MONTANA. ARIZONA. Yuka, August; COLORADO. Port Townsend, August (Seaton); Seattle, July; WASHINGTON. Victoria, B. C., July 20 (Osborne); Vancouver Island, B. C., July 7 to 12; Calapooia Mts., 1400–1600 ft., August 11; Kamloops, B. C.; Beaver Mouth, B. C., July 14; CANADA. Common from Br. Col., to southern California. (Chamberlin.) Breeds in Douglas fir, yellow, lodge pole, sugar and Monterey pine and western red cedar (*Thuja plicata*). (Chamberlin.) This species mines yellow pine and Jeffrey pine in the Rocky Mountains and Pacific States. Injury similar to that of *Buprestis apricans*. Entrance is made through wounds in the bark. Lightning struck trees are especially subject to attack. Adults emerge in spring and early summer. (Burke.)

Mr. W. J. Chamberlin informs us that he has bred extensive

series of this insect and that all of the various species from the Pacific Coast, erected on size, color and individual variations are nothing but extreme forms. From one female he secured a series showing an extensive enough variation in size, shape and color ranging from entirely green with no cupreous markings to entirely cupreous, to warrant the above synonymy. *Aurulenta* is very common along the Pacific Coast and one of our most beautiful buprestids.

Mr. Gilbert Arrow states that there are no European specimens of this species in the British Museum and knows of no reason for supposing that it occurs in Europe. Kerremans also treats it as a strictly American insect. This will make *B. lauta* of Le Conte a synonym and correct the present mistaken idea that *aurulenta* is European. Van Dyke states that the form *villosa* described by Le Conte is identical with *aurulenta* except for its more pubescent prosternum which character is very variable and by means warrants the erection of a species.

Buprestis adjecta (Le Conte), 54–17.

brevis Casey, 09–118.
intricata Casey, 09–118.

Stout, more oval than preceding. Elytra entirely deep or light green with a faint brassy luster; suture and lateral margins often narrowly cuprescent; tips bidentate, elytral costæ intermediately elevated, convex, their summits polished and not punctate. Antennæ dark, more or less metallic. Head and pronotum green, often with a brassy tinge, densely punctate, head with a distinct median sulcus, pronotum not, to distinctly impressed along median line, broadly rounded at sides. Beneath metallic with a distinct cupreous shine, prosternum and abdomen coarsely and densely punctate, scarcely truncate. Length 13–18 mm.

RECORDS.—Gallinas Canon (Snow); NEW MEXICO. IDAHO. Tahoe Tavern, July 10; Tallac, elevation 6300 ft., July 16 (Reynolds); Weed, July 20 (Chamberlin); Sierra Nevada Mts.; CALIFORNIA. Ft. Klamath; Oregon (Packard), (Chamberlin), OREGON. WASHINGTON (Leng Coll.). NEVADA. Bullion Peak, August (Oslar); Manitou, August; Colorado Springs (Wheeler); COLORADO. National Park; WYOMING. Beaver Foot Range Rocky Mts. (Wenman); Peachland, B. C., August; Field, B. C., August 1 (Brown); Vancouver; CANADA. Ohau, Honolulu, one specimen on flowers (Blackburn & Sharp); H. I. Occurs from Washington to Tulare County, California. (Chamberlin.) Probably breeds in yellow, Jeffrey and lodge pole pine. (Chamberlin.)

This species appears to be both local and rare. Few of our eastern collections have it represented by more than one or two examples. The two forms (*intricata* and *brevis*) described by Casey have no good constant characters and should be placed in synonymy.

Buprestis sulcicollis (Le Conte), 59–208.

lateralis Casey, 09–119.

Convex. Elytra obliquely narrowed and slightly prolonged at apex, uniform, dull, dark, coppery brown usually with a very slight tinge of green, four elytral costæ, suture and margin elevated, third of true elytral costæ very short. Antennæ dark, first two segments bronzed. Head and pronotum dark coppery brown, latter deeply channeled, pronotum becoming arcuate toward base. Ventral surface dull cupreous, densely punctate, punctures of prosternum coarse, those of abdomen fine, tip broadly rounded. Length 13–15.5 mm.

Records.—Lake Superior (Le Conte). Monmouth, June 24; Paris (Frost); Maine. Hampton (Shore); New Hampshire. Marquette, June 25 in wash up (Sherman); Michigan. Keene Valley, Essex County, July (Notman); New York. Nova Scotia.

Food plants, white and pitch pine.

This species is exceedingly rare and appears to be confined to the northeast. The occasional records from Florida and the south undoubtedly refer to the true *Buprestis striata* which is also a uniform dark coppery brown above, but which is easily separated by the characters given in the key and also by the pronotum not being channeled as it is in *sulcicollis*. Dr. E. C. VanDyke who examined the type in the Le Conte collection finds that it is not a brassy green insect as claimed by Casey but of a uniform dull, coppery brown with a very slight greenish reflection. This places the dark form described by Casey as *lateralis* in synonymy.

Buprestis striata (Fab.), 75–267.

obscura Casey, 09–125.

Elongate. Elytra dark coppery brown with a cupreous shine, four elytral costæ, suture and margin elevated, costæ flat and punctured, intervals densely, coarsely and confluently punctate. Antennæ greenish, more or less bronzed. Head and pronotum uniform dark coppery brown with a cupreous or brassy luster. Head and pronotum densely and coarsely punctate, sides usually parallel, slightly sinuate, rarely arcuate or broadened posteriorly. Ventral surface and legs bronzed or cupreous. Prosternum densely and coarsely, abdomen, finely punctate. Male narrower than female with tips of abdomen more broadly rounded. Length 13–20 mm.

RECORDS.—WEST INDIES. Vowell's Mill (Coverdale); LOUISIANA. La Grange, Brevard County; Jacksonville, beaten from pine saplings (Dury); FLORIDA. TEXAS. Cobham; VIRGINIA. Southern Pines, May, September (Manee); NORTH CAROLINA. GEORGIA. Lakehurst, May 28 (Davis); Ft. Lee, in hemlock (Joutel); Newark; Westville (Liljeblad); Da Costa, May 30 (Smith's List); Alloway, July (Hornig); NEW JERSEY. Minnewaska, Ulster County, July 27, from dead pine (Nicolay); Valhalla, April 2 from pitch pine (Schott); Keene Valley, Essex County, June, July, August (Notman); NEW YORK. Cincinnati (Dury); OHIO. Hummelstown, May 5, April 1 chopped from *Pinus rigida* log (Knull); PENNSYLVANIA. Cook County; ILLINOIS. Mineral Springs, July 4, under bark of living tamarack (Wolcott); Pine, May 3; Miller, July 2, 15, August 7 (Liljeblad); INDIANA. Pentwater, August 20 (Liljeblad); Pequanning, August 10, ovipositing on pine (Hebard); shore of Keweenaw Bay, August 10 (Hebard); MICHIGAN. St. Louis, November 27; MISSOURI. May 4, June 5 (Blanchard); MASS. Sanborn, July 16; NEW HAMPSHIRE. Quebec, August 5; Levis County (Roy); Terrebonne County (Hausen); Montreal Island (Chagnon); Vaudreuil County, July (Winn); CANADA. From pitch pine cordwood, Oct. 27, Nov. 22; from late March to early April among needles of young long leaf pine; mid April to early May rather active and often above reach on denuded trunks of blasted pines where they mate and oviposit. (Manee.) Dug from white pine stumps. (Blanchard.) Remains in wood as adult from late October to spring and emerges in early April, seeks pine in its second death year. (Manee.) Larva sometimes found in sound pine logs but more frequently in decaying stumps. (Saunders.) Appears upon pine and spruce trees in May and June; prefers dead wood of logs and stumps to living trees; has been met with in two instances at the tips of the limbs of young spruce trees and probably feeds upon young tender buds of pine and spruce. (Fitch.) According to "Insect Life" (Vol. II, p. 369), *Buprestis striata* is mentioned as having been received from T. C. Harris, Raleigh, N. C., together with the statement that it had been found in a clothing store and had died after cutting eight holes through a pair of heavy woolen pantaloons. The editor replied that it had probably emerged from wood-work and had cut the clothing in an effort to escape.

Food plants, *Pinus strobus, rigida* and probably all the southern yellow pines.

Buprestis striata var. **impedita** Say, 36–160.

canadensis Casey, 09–124.

Identical in form and structure with preceding. Separated by dorsal surface being more or less green with suture and sides of elytra cupreous, pronotum and head green with bronze luster. Ventral surface and legs bright green to bronzed cupreous. Length 13–17 mm.

Records.—South Paris (Frost); Waterford; Cumberland County, July 8 (Nicolay); Monmouth, June 23, ovipositing beneath chip protruding from scarf of a white pine stump cut previous winter (Frost); Maine. Sanborn, July 16; New Hampshire. Minnesota. Essex County (Wiltbank); Bayshore, Long Island (Shoemaker); Catskill Mts.; New York. Ft. Lee; New Jersey. Hummelstown, April 1, chopped from *Pinus rigida* log (Knull); State College, May 13 (Knull); Rockville, April 24 (Champlain); Pennsylvania. Horn Mtn. Club (Sherman); Marquette, June 25, in wash up (Sherman); Michigan. Sudbury, Ont.; Hymens, Ontario, Sept. 1; Canada.

The fact that the variety occurs with the true *striata* prevents it from being regarded as a good geographical race. In a large series there are indistinguishable intermediates which prevent the raising of *impedita* to specific rank. *Impedita* should be placed in collections as a distinct color variety of *striata* but we believe the line should be drawn here. In our experience this species is never met with in numbers but Sherman has taken it quite commonly in wash up along the shores of Lake Superior during June.

Shelford in his work "Color and Color Pattern Mechanism of Tiger Beetles" (Ill. Biol. Mon., Vol. III., No. 4) concludes that the brilliant colors of the group are due to thin surface films of material having the properties of metals. Prof. Michelson is inclined to attribute differences in the colors to differences in the chemical constitution of the film and color changes during ontogeny to changes in chemical constitution but states that this would be difficult to demonstrate on account of the minuteness of the film. In view of this, it is extremely probable that buprestid colors and color changes are due to similar causes.

Buprestis apricans Herbst, 01–125.

nigricornis (Sturm), 26–105.
bosci Castelnau & Gory, 37–146.
cribripennis Casey, 09–127.

Oblong, oval. Elytra uniform dull cupreous brown, punctate-striate. Antennæ dark, first two segments bronzed. Head and pronotum coarsely densely and confluently punctate. Sides of pronotum slightly arcuate. Ventral surface cupreous with greenish reflections, prosternum coarsely and densely, abdomen more finely and distinctly punctate. Tip of abdomen truncate and subsinuate in male, broadly rounded in female. Length 16–23 mm.

RECORDS.—Southern Pines, April 25, May 9 (Manee); NORTH CAROLINA. Grand Bay; ALABAMA. SOUTH CAROLINA. Vowell's Mill (Coverdale); LOUISIANA. Jacksonville, beaten from pine saplings (Dury); Deep Lake, April 12 (Davis); FLORIDA. Tyler County; TEXAS. Billy's Is., Okefinokee Swamp (Bradley); GEORGIA. Late March to early April among needles of young long leaf pines, probably feeding; mid-April to mid-May on dead blaze of big, living long-leaf pines. Oviposits exclusively in cracks of dry dead spots or blazes of large living long leaf pines. (Manee.) Known as the flat-headed turpentine heartwood borer. Injures longleaf pine of Southern States when boxed for turpentine, fire-scarred or otherwise injured. Larval mines are oval, 6×10 mm. in diameter and wind back and forth through sapwood and deep into the heartwood. This shortens the life of the tree as a producer of turpentine and spoils part of it for lumber. Trees often so badly riddled that they are broken over by the wind. Adults emerge during late winter and spring. (Burke.)

There is nothing in the description to warrant the retention of the name *cribripennis* even as a slight variety. The species is southern and rarely taken north of the Carolinas. It is probable that a record such as one from New Jersey (Boonton, N. J.), Jan. 31, under bark of dead pine (G. M. Greene), refers to a straggler and should not be included in the regular distribution of the species.

Buprestis decora (Fab.), 75–217.

Elongate, narrower than preceding species. Elytra punctate, striate, green or occasionally with a distinct indigo-blue median vitta, suture and lateral margins always cupreous, tips bidentate. Antennæ black, slightly metallic, first three segments light green. Head and pronotum green, often with a cupreous luster, densely and coarsely punctate, pronotum occasionally

with a faint median sulcus, more often entirely wanting, widest at base, gradually narrowing toward apex, about two-thirds wider than long. Ventral surface and legs entirely greenish to bronzed, densely punctate, punctures of prosternum coarse, those of abdomen fine. Ventral surface of male slightly more hairy, tip of abdomen truncate and subsinuate, that of female subtruncate. Length 11–18 mm.

Records.—Southern Pines, April 6, May 7 (Manee); Wrightsville, April 6 (Davis); North Carolina. Grand Bay, April, March (Loding); Taylor Co., April (Genung); Mobile, March (Loding); Alabama. Jacksonville, beaten from pine saplings (Dury); Big Pine Key (Davis); Orlando (Pearsall); Florida. Louisiana. Thomasville, April 1 (Hebard); Georgia. Tyler County; Texas. Cobham; Virginia. Gloucester County; New Jersey, Pa. Little Rock; Ark. Larvæ and adults split out of rotted pine railway ties in late October; in December, they may leave their fuel home on account of the warmth of the woodbox; from mid-March to early May among needles of young long-leaf pines probably feeding; in May on denuded trunks of dead and semi-decadent pines; an occasional stray specimen in June. Remains in wood as adults from late October to spring emerging about March 1. *Decora* prefers rotted pine. (Manee.)

This species is not at all rare in the south and on account of its remarkable constancy in color, form and size, can be readily distinguished from all other species.

Buprestis salisburyensis (Herbst), 01–174.

ultramarina Say, 36–160.

Short, oval. Elytra with practically the same markings as those of preceding species, tips rounded, not bidentate, only about two-thirds longer than wide. Antennæ blackish green, first two segments bronzed. Head and pronotum as in *decora*, pronotum shorter, sides more arcuate. Beneath, similar to *decora*. Length 11–14 mm.

Records.—Southern Pines, March 26 (Leng); North Carolina (Horn Coll.). Georgia (Le Conte). Da Costa, July 4 (Skinner); Clementon, May 7 (Coxey) (G. M. Greene); Sumner, May 13 (Coxey); Lakehurst, April 30 (Davis); Sea Isle, May 24 (Boerner); Westville, April 19; Atlantic City, June 28 (Smith List); Gloucester, April 20 to May 5 (Tolman); New Jersey. Carlisle Jc., August 9 (Champlain); Southwestern Pa. (Hamilton); Pennsylvania. Wis-

CONSIN. Sandy Plain near Au Sable Forks (Leng), June; NEW YORK. May, rare (Blanchard); Mass. Breeds in pine. Beaten from pitch pines and split from pitch pine knot. (Blanchard.) Food plant, *Pinus rigida.*

This little species is one of the first if not the first buprestid to appear during the spring in the Atlantic States. It is by no means common but can be beaten from the needles of young healthy pines. The earliest record for New Jersey is April 14.

Buprestis maculativentris Say, 24–272.

sexnotata Castelnau & Gory, 37–129.
maculiventris G. & H., 69–1378.
lecontei Saunders, 71–40.

Elongate, slightly oval. Dorsal surface polished green to bronzed, shining. Elytra moderately smooth and evenly convex, not strongly furrowed, sparingly punctate. Head densely and coarsely punctate, usually with a small yellow spot above and with one or more spots between the antennæ. Antennæ bronzed to greenish. Pronotum coarsely densely and unevenly punctate with a smooth median line. Anterior angles generally with a slight touch of yellow but often immaculate, sides parallel, straight or broadly arcuate at or before the basal half. Ventral surface and legs bronzed to greenish, deeply densely and evenly punctate, immaculate except for a row of lateral yellowish spots on abdomen. Length 14–20 mm.

RECORDS.—Jackman (Harvey & Knight); Harrison, July (Pollard); Monmouth, June 24, from dead stump of *Abies balsamea,* July 16 (Frost); Redding, July 14 (Frost); Wales, July 14 (Frost); MAINE. Summit Mt., Washington, July 2, 6290 ft. (Dodge); White Mts.; Sanborn, July, August; Jefferson, August (E. D. Harris); NEW HAMPSHIRE. Lowell (Blanchard); Hubardston; MASS. Catskill (Joutel Coll.); Whiteface Mtn. Trail (Davis); Saranac Lake (Leng); Wilmington, August (Davis); Lake Placid, July 10 (Felt); Keene Valley, July, August (Notman); NEW YORK. PENNSYLVANIA. Putnam Co., rare, June 18; INDIANA. Pequaming, August 14 (Hebard); Point Abbaye, August 13 on hemlock (Hebard); Isle Royal; Marquette, June 25, common in washup (Sherman); MICHIGAN. Duluth (Doggett); MINNESOTA. Keshena (Skinner); WISCONSIN. Mac Nabs Island; Nova Scotia; Halifax; Cape Bretton (Leng); Hudson Bay Territory, Lake Superior; New Foundland (Le Conte); Victoria Beach; Winnipeg, Man., August 7 (Wallis); Grimbsy, Ont., July 7 (Brimly); Aweme, Man.; Port Credit, Ont.,

August 22; Toronto, Ont.; Montreal, Que., July 14; Levis Co., Que., August 12; Matane Co., Que., August (Winn); Terrebonne Co., Que (Hausen); Sherbrook, Que. (Begin); Montreal Isle, July (Chagnon); Vaudreuil Co., Que., July (Stevenson); Argenteuil Co., Que. (D'urban); Canada. Common on old and young spruce trees in June and July. Beetles have emerged from pine timbers about the end of June. (Harrington.) This species is locally common and has a wide range.

Food plants, balsam and spruce.

Buprestis maculativentris var. **rusticorum** (Kirby), 37–151.

paganorum (Kirby), 37–152.
acomana Casey, 09–100.
morosa Casey, 09–101.
fusca Casey, 09–101.
sublivida Casey, 09–102.
caliginosa Casey, 09–102.
nigricans Casey, 09–102.
lyrata Casey, 09–103.
adducta Casey, 09–103.

Broader and more oblong than preceding species. Upper surface black with more or less of a bronzed or greenish shine. Elytra strongly furrowed, numerous minute punctures in furrows, more scattered on interstices. Antennæ dark metallic green to bronzed. Head densely and coarsely punctate with only a small spot above the antennæ to the entire anterior part being yellowish or reddish. Pronotum sometimes impressed, more often not at all so, but with a distinct median line, coarsely and unevenly punctate, sides ranging from nearly parallel and slightly arcuate at basal half to uniformly broadly rounded, anterior angles yellowish to reddish. Ventral surface and legs dark with a bronzed or greenish shine, densely, evenly and moderately punctate. Immaculate except for a row of lateral yellowish or reddish spots on abdomen, frequently wanting except on last segment. Apex of abdomen broadly emarginate in male, truncate in female. Length 15–23 mm.

Records.—Ranier, April, June; Sedalia; Dilley; Divide, Douglas County; Blue Mts., August 6 (Chamberlin); Grant County, June 22; Oregon. Ft. Wingate, August 1 (Woodgate); Beulah (Cockerell); Cloudcroft (Knaus); Las Vegas Hot Springs (Schwarz & Barber); High Rolls, May 31; Albuquerque; New Mexico. Texas (Schaupp). Boulder, July 13; Colorado Springs (Oslar); Creede, 8844 ft., August (Hunter); Manitou, July 16 (Packard); Colorado. Northern California (Chamberlin); Fresno County; Stanford Uni-

versity, October 10 (Trimble); Sierra Nevada Mts., summit, Lake Tahoe; CALIFORNIA. Helena, July 10 (Mann); MONTANA. NEVADA. King County, 2800 ft. August 5; Tacoma, September 14 (Fernecke); Port Townsend; Seattle; WASHINGTON. Moscow Mts., July 8; IDAHO. KANSAS. Glacier B. C. (Schaeffer); Beaverfoot Range, Rocky Mts. (Wenman); Field, B. C., August 1 (Brown); Beaver Mouth, B. C., July 14; Peachland, B. C., August 3 (Wallis); Golden, B. C., August, Latitude 54, B. C.; Cross Lake, Oxford House, Man. (Bell); Cumberland House, Saskatchewan; Vancouver Is.; CANADA. Abundant in pine woods of Oregon and Washington. (Packard.) Rather abundant in certain situations; of 79 specimens collected 63 were taken feeding on the needles of *Pinus ponderosa;* many observed copulating during August; breeds in yellow pine and Douglas fir and occurs in all northern counties of California. (Chamberlin.) *Pseudotsuga taxifolia, Abies grandis.*

This is a geographical variety of the preceding, from which it can be readily separated by the strong elytral furrows, broader form and blackish coloration. Although confined to the west, it has a wide range north and south, examples having been taken from British Columbia to New Mexico. This form has recently been split into a number of species but the characters by which they are separated such as impression along the pronotum and shape of thorax are variable and unreliable.

Buprestis maculativentris var. **subornata** (Le Conte), 59–208.

rubronotans Casey, 09–97.
adonea Casey, 09–97.
histrio Casey, 09–98.
punctiventris Casey, 09–99.
violescens Casey, 09–99.

Broad, moderately convex. Dorsal surface green to dull metallic green or violaceous, slightly shining. Elytral intervals strongly and alternately convex, sparsely punctate. Head deeply and distinctly punctate, anterior portion variously marked with orange-yellow. Antennæ green to dark greenish black. Pronotum coarsely, distinctly and unevenly punctate with a smooth median line, sides nearly straight, often broadly arcuate at basal half, anterior angles orange-yellow. Ventral surface and legs metallic green to bronzed, moderately coarsely and closely punctate; immaculate except for two discoidal orange-colored spots on each abdominal segment more or less connected with the lateral ones. Last segment truncate in female. Length 17–19 mm.

Records.—Weed, August; California. Kansas. Utah. Oregon. Montana. Las Vegas Hot Springs (Schwarz & Barber); New Mexico. Colorado Spgs. (Oslar); Colorado. Food plants are *Pinus ponderosa* (Chamberlin) and Douglas fir (Garnett).

This variety can be readily distinguished from the preceding by the uniform green to violet hue and the arrangement of the spots on the abdomen. The species described by Casey are undoubtedly individual variations.

Buprestis maculipennis Gory, 40–119 (Plate I, Figs. 1 and 2).

inconstans Melsheimer, 46–146.
deficiens Casey, 09–90.
fusiformis Casey, 09–91.
scripta Casey, 09–91.
reducta Casey, 09–92.
leporina Casey, 09–92.

Elongate oval. Elytra black with a distinct brassy tinge, yellowish markings extremely variable ranging from a few scattered spots to large confluent patches covering entire elytra except humerus, suture, lateral margins and triangular spot in center running from lateral margins to suture and apex which are brassy black; striæ finely and closely, intervals coarsely punctate. Antennæ brassy to piceous. Head densely and coarsely punctate (♂) having anterior portion yellowish with two central spots and small dot at base of each antenna brassy black; (♀) entirely dark except for small yellowish spot between the eyes and antennæ. Pronotum brassy black rarely with greenish tinge, deeply to distinctly punctate, anterior angles yellowish. Under side and legs bronzed often with a greenish tinge; entirely immaculate to irregularly spotted with yellow, deeply and distinctly punctate. Anterior margin of prosternum entirely pale to dark with pale dots; prosternal spine bronzed rarely entirely yellow distinctly and sparingly punctate. Last abdominal segment with a transverse yellowish to orange-red spot at sides near base, in rare cases entirely wanting. Males with last abdominal segment truncate, females rounded. Length 10–14.5 mm.

Records.—Big Pine (Davis); Florida. Vowell's Mill (June); Louisiana. Cape Henry; Virginia. Belleport, L. I., July 23, August 30, occurs with *lineata* but not so abundant (Nicolay); Massapaequa, L. I., June 29 (Shoemaker); Sandy Plain near Au Sable Forks; New York. Pennsylvania. Jamesburg, July 2 (Davis); Lakehurst, July 11 (Davis); New Jersey. Miller's, July 21 (Selinger); July 2, 11 (Liljebald); Mineral Springs, July 4 (L. & G.); Indiana. White Sulphur Springs, July 18 (Robinson); West

VIRGINIA. Pentwater, July 24 (Liljeblad); MICHIGAN. Paris, July 18 (Frost); MAINE. MASS. N. CAROLINA. MISSOURI. On dead pine logs. (Nicolay.) This species is certainly distinct and should never have been united with *lineata,* from which it may be readily distinguished by the yellowish elytral spots, more oval form and the distinct brassy tinge. Occurs with *lineata* but rarer. Owing to the wide variation in this species Casey has seen fit to describe five new forms. Two (*deficiens* and *inconstans*) he has returned to *maculipennis* (Mem., V, 1914, p. 355). As the remaining four (*fusiformis, scripta, reducta, leporina*) do not represent either good geographical varieties or species with constant and distinguishable characters, they should be placed as synonyms of *maculipennis.*

Buprestis lineata (Fab.), 75–217.

More elongate than preceding. Elytra black not so distinctly brassy, each with two more or less connected brick red to fulvous vittæ, which although sometimes entirely wanting are never broken up into distinct spots (Plate I, Fig. 4); striæ finely and intervals coarsely punctate at sides becoming finer approaching suture. Antennæ coppery to bronzed green. Head densely punctate, bronzed, anterior portion more or less marked with fasciæ or spots which are fulvous. Pronotum bronzed except anterior angles which are brick red to fulvous, deeply and distinctly punctate. Prosternum densely punctured, bronzed, anterior margin fulvous, prosternal spine sparingly punctate. Ventral surface and legs distinctly punctate, punctuation varying from fine to coarse. Last ventral segment marked with reddish near each anterior angle, sometimes quite large and almost united into a fascia but more commonly small and almost wanting. Males with last abdominal segment truncate, females rounded; a small tooth on each side. Length 12–17 mm.

RECORDS.—WEST INDIES. Enterprise; Ft. Capron; Tampa (Schwarz); Jacksonville, beaten from pine saplings (Dury); Lakeland, May 6; Gainesville; La Grange, Brevard County, September (Davis); FLORIDA. Opelika, August 2 (Hebard); Vernon Ph. (Davis); Vowell's Mills; LOUISIANA. Cobham; East Fall's Church, August 22, 30 (Gabrielson); VIRGINIA. White Sulphur Springs, July 19 (Robinson); W. VIRGINIA. MARYLAND. Billy's Island, Okefenokee Swamp, June (Loding); Jesup, Wayne County, September 1 (Rehn & Hebard); GEORGIA. Mobile, August; Grand Bay, May 25 (Loding); ALABAMA. TEXAS. Southern Pines, June to July, on blasted pines, occasionally on pine logs (Manee); NORTH CAROLINA. Bayshore, L. I., July 22 (Shoemaker); Yaphank, L. I., July (Davis);

Long Pond, Wading River, L. I., July 27 (Davis); Belleport, L. I., July 23, August 8, common on dead pine logs (Nicolay) Karner, July 10 (Joutel Coll.); New York. Lakehurst, July 28 (Davis); Sea Isle, April 26 (Luccareni); Malaga, August 4 (G. M. Greene); Newark (Bischoff); Da Costa, July 28 (Daecke); Brigantine Beach, in drifted wood (Hn.); Jamesburg, Aug. 4 (Joutel); Anglesea, June 14 (Brn.); New Jersey. Lake Co., rare, June 29, July 25; Indiana. Providence, under bark of white and pitch pine (Packard); Rhode Island. Lehigh Gap, July 3 (G. M. Greene); Inglenook, April 18 (Kirk); Pennsylvania. Dartmouth, June 13 (Easton); Framingham, dug dead out of white pine stump (Frost); Lowell, July (Blanchard); Mass. Nova Scotia (Hall); Toronto, Ont. (Crew); Terrebonne Co., Que. (Hausen); Canada. Not common in Canada. Prefers pine in first death year. (Manee.)

Food plants, *Pinus strobus, rigida.* Mines wood of injured, dying and dead trees; loblolly pine (*Pinus tæda*); scrub pine (*P. virginiana*), and long leaf pine (*P. palustris*); pupates and transforms to beetle stage from April to June, flies from April to August, (Burke).

Buprestis lineata var. **davisi** new variety.

Similar in form to preceding. Elytra brassy black each with either two more or less connected yellowish vittæ or having yellowish markings spread over entire surface, except for shoulders, lateral margin, suture and just behind the apex. Striæ and intervals finely punctate. Antennæ green, usually slightly bronzed. Punctuation and markings of head same as in *lineata.* Pronotum bronze to green with faint touch of bronze, anterior angles marked with yellowish to fulvous which often extends along lateral margins as far as posterior angles. Prosternum densely and deeply punctate, anterior margin yellowish to slightly fulvous; prosternal spine sparingly punctate. Ventral surface and legs variable bronze to green, distinctly, densely and deeply punctate. Last ventral segment having a small yellowish spot near each anterior angle. Males with last abdominal segment truncate, females rounded; a small tooth on each side. Length, male 15–18 mm., female 16.5–18 mm.

Described from a series of two males and three females collected by Mr. W. T. Davis at Cocoanut Grove, September 14, and Big Pine Key, Florida. Holotype (♂) and two paratypes (♀) in the collection of Mr. Davis. Allotype (♀) and one paratype (♂) in the Nicolay collection.

This form can be readily recognized by the light yellowish mark-

ings, more confluent than in *lineata*. It seems to be a distinct geographical race and as no specimens of the true *lineata* were taken in the same locality, we believe the form should receive a varietal name.

Buprestis nuttalli (Kirby), 37–152.

"Body black-bronzed, glossy, punctured; underneath with a few pale decumbent hairs. Head confluently punctured with several irregular connected levigated spaces; labial palpi, spots on the mandibles, labrum, lower margin of the eyes and frontal spots yellow. Prothorax bisinuate both at the apex and base, grossly punctured with several levigated spaces; lateral margin except the base and parts of the anterior yellow, elytra slightly furrowed, furrows punctured, interstices alternately convex and plane, the sutural one is convexed and forked at the base, the flat ones are most punctured but the convex ones more grossly; in the disc of the elytra are three equidistant irregular yellow spots arranged longitudinally, and nearer the base, on the second ridge a line of confluent yellow dots: the apex of the elytra is truncated; on each of the ventral segments of the abdomen the sides are marked with a triangular orange-colored spot, those on the anal segment being larger and irregular: the coxæ also and underside of the thighs are partly of the same color.

"Variety B. Without the yellow line of confluent dots at the base of the elytra and with the spots arranged longitudinally indistinct.

"C. With all the ventral orange spots large and irregular.

"D. Front with a large central spot. Base of the belly bluish.

"E. Elytra without yellow spots. Front as in D.

"F. With only one distinct yellow spot.

"Length 15–17 mm. (Latitude 65 and Rocky Mts.)"

RECORDS.—Port Yucan, Sahnon River (Blasse), ALASKA?. MONTANA. Telegraph Creek; Hudson Bay; Edmonton, Alta., July 3 (Carr); Banff, Alta., June 1; Dawson, Yukon; CANADA. On pine.

The above original description is presented in order to clear up the now existing confusion in correctly identifying the true *nuttalli*, which is strictly a northern species. The elytra varies in color from black with a distinct greenish tinge to plain black. This species can be separated by the rounded pronotum and the spots at the side of each abdominal segment. The yellowish markings of the head are variable and cannot be relied upon; the lateral margins of the thorax also vary from entirely yellow to black with just the anterior tips yellowish. Tip of abdomen is truncate in the female without prominent teeth.

Buprestis nuttalli var. **alternans** Le Conte, 59–207.

conicicauda Casey, 09–93.
diruptans Casey, 09–94.
contorta Casey, 09–94.
gravidula Casey, 09–95.
torva Casey, 09–95.
boulderensis Casey, 09–96.

Similar in form but usually larger and broader than preceding, without metallic luster, abdomen coarsely punctate. Similar in markings and general appearance to *consularis,* in fact specimens from Washington could easily be mistaken for the eastern form. Can be separated from preceding by the more strongly convex alternate interstices of the elytral striæ, its large size and coarser punctures of the abdomen. Length 16.5–20 mm.

Records.—Washington. Gallinas Cañon (Snow); Water Cañon (Snow); Ft. Wingate, June; Grant County (Howard); Las Vegas Hot Springs (Schwarz & Barber); New Mexico. Willow Creek, Cusack Ranch; Colorado. Arizona. California.

This is a western and southwestern variety. There is a need of additional material especially from the southwest, which we believe will prove our contention that there is a single species with an extremely wide geographical range and individual variation. In a series of specimens from one locality in the collection of Mr. Chas. Schaeffer, there is considerable difference in the shape of the pronotum, which varies from broadly arcuate to sinuate with posterior half inflated. This makes it extremely difficult to separate from the other forms, as certain specimens have the characters of *nuttalli* while others agree with the description of *alternans.* From this it would appear that there is but a single species.

Buprestis nuttalli var. **consularis** Gory, 40–120.

flavopicta Casey, 09–96.

Elongate oval, black without metallic luster. Elytra with three or four orange yellow fasciæ, one at base, another just before and behind the center and one before apex, often broken up and interrupted by black elytral striæ. Alternate interstices convex. Beneath bronzed, more or less marked with orange red, moderately and distinctly punctate. Legs bronzed. Last abdominal segment truncate in both sexes. Length 13.5–17 mm.

Records.—Marquette; Michigan. New Hampshire. Monmouth, July 17, on stump of dead *Abies balsamea* (Frost); Paris, July 18 (Frost); Maine. Lowell, July, August (Blanchard); Mass. Keene Valley, Essex County (Notman); New York. Lahaway,

July 5 (Smith); Lakehurst, July 22 (Davis); NEW JERSEY. Great Falls, July 4, adults found on pine slash (Knull); VIRGINIA. Duluth (Doggett) MINNESOTA. Cincinnati; OHIO. State College, July 19 (Knull); Harrisburg, July 31 (Knull); PENNSYLVANIA. White Sulphur Springs, July 8, August 11, on pine (Robinson); W. VIRGINIA. Ottawa; White Fish Point, Lake Superior; Sudbury, Ont.; Gory, Ont.; Levis Co. (Fyles); Vaudreuil Co. (Ouellette); Montreal Island, July (Beaulieu); CANADA.

On pitch pine. (Blanchard.) Breeds in decayed *Pinus rigida* and *virginiana*. (Knull.) This is the eastern form separated by the convex alternate interstices of the elytral striæ and the pronotum usually being sinuate and with a distinct swelling at the base.

Buprestis læviventris (Le Conte), 57–43.

pugetana Casey, 09–94.

This is a western species which can be readily separated by the smooth surface of the elytra, the variable yellowish markings usually uninterrupted by the black striæ and the feeble punctuation of the abdomen. This species quite often has a distinct greenish luster. Length 14–20 mm.

RECORDS.—Mt. Shasta, July; Northern California (Chamberlin); Truckee, 5800 ft., August (Wickham); Weed, August (Chamberlin); McCloud, July 2 (Van Dyke); CALIFORNIA. Tacoma; WASHINGTON. OREGON. ARIZONA.

Numerous in northern California, prefers old dry logs and poles without bark; eggs deposited in or on logs where there is no bark; many taken on railroad ties and in dust along road. (Chamberlin.) On *Pinus ponderosa*. Yellow, lodgepole, digger and sugar pines (Garnett).

Buprestis confluenta Say, 23–159.

confluens Le Conte, 59–206.

tessellata Casey, 09–104.

Elongate, slightly more oval than preceding species. Above bright emerald green to bluish, elytra thickly and confluently spotted with yellow, striæ closely and intervals sparingly punctate. Antennæ green. Head and pronotum green, coarsely and thickly punctured. Prosternum green, densely and coarsely punctured at sides, less so toward center. Ventral surface greenish with coppery luster, abdominal segments sparsely and finely punctate. Legs green. Males with broad yellow vitta extending from the anterior margin of the prosternum to near the apex of the first abdominal segment; females without pale markings. Length 14.7–16 mm.

Records.—Wallace County, 3000 ft. (Snow); Kansas. Clear Creek, July (Oslar); Littleton, June 24, July 7 (Frost); Colorado. Miller, July 16 (Liljeblad); Indiana. Peoria, Illinois. Buffalo Gap (Hall); Dakota. Utah. Badger (Colt); Nebraska. Lusk, July (Williams); Wyoming. Texas. Nevada. Great Basin (Chamberlin); Lake Tahoe (Van Dyke); California. Oweme, Man. (Criddle); Makinak, Man.; Montreal Island, Que.; Rouville Co., Que., July 10; Leduc, Alta., August 3; Wabamun, Alta., July 2 (Carr); Canada.

B. confluenta mines the wood of injured, dying and dead aspen (*Populus tremuloides*) and cottonwood (*P. deltoides*); flies from July to September; attacks planted cottonwood. (Burke.)

B. tessellata described from Texas by Casey has no good character even to warrant the erection of a subspecies and such forms should be placed with *confluenta*. Specimens of *confluenta* from Alberta, Canada, and other northern localities appear to be more elongate and parallel and less spotted than specimens from Nebraska, Texas and the south.

Buprestis rufipes (Oliv.), 90–16.

virens Casey, 09–105.

elongata Casey, 09–105.

Elongate parallel, above metallic green, more rarely with a bluish violet luster. Elytra having a basal stripe, two spots behind middle and tips yellow and bidentate, striæ narrow densely, intervals sparingly punctate. Antennæ pale brown. Head and pronotum green or bluish, coarsely punctured. Hypomera yellow; prosternum metallic green except anterior margin and broad median vitta brownish yellow. Beneath green, last three ventral segments reddish brown with more or less of a purplish tinge, the last one generally marked with a large spot of yellow; a median stripe usually broken into spots and a row of dots along the sides yellow. Legs brown, rarely in part black to metallic green. Males distinguished by having last abdominal segment truncate, females sinuate. Length 17.5–25 mm.; extreme, 12 mm. in male and 28 mm. in female.

Records.—Crescent City; Enterprise, not rare in oak trees (Schwarz); Steinhatchee River; Florida. Comal County; Brownsville, July; New Braunfels, May 5 (Mittendorf); Texas. Newport News (Bailey); Cobham; Nelson County, July 9 (Davis); Virginia. Near Little Paint Brook, Prince Georges County (Davis); Maryland. Southern Pines, June 30 (Manee); North Carolina. Cov-

ington, Vowell's Mills, August; LOUISIANA. KENTUCKY. Seashore (Liebeck); Anglesea, July, on oak and flying around dead wood; Cape May (Smith's List); NEW JERSEY. Ardmore, August 14 (Mrs. Skinner); Frankford, July 1, August 14 (Schmidt); Angora, August 18, on dead beech (G. M. Greene); Overbrook, July 28 (G. M. Greene); Lancaster County (Beer); Harrisburg, July 13, adults taken on dead hickory (Champlain); Hummelstown, July 5, 15, on dead tulip poplar and beech (Knull); Phila Neck, July 9, 30, on maple and beech (Hornig); PENNSYLVANIA. Southern half of state, scarce, July 4; INDIANA. GEORGIA. Douglas County, 900 ft. (Snow); KANSAS. Cincinnati (Dury); OHIO. MISSOURI.

Breeds in oak and beech. (Chittenden.) In dead beech and maple (Dury), and the southern yellow pines. Mines chestnut, hickory, tulip (Burke).

In his Memoirs, V, 1914, p. 355, Casey states that *virens* is the female of *rufipes*. The form described as *elongata* by Casey on its possession of blackish legs should be referred to *rufipes*, as in the examination of extended series the color of the legs was found to exhibit considerable variation. The markings of this species are remarkably constant, the greatest degree of variation being in the size.

Buprestis viridisuturalis n. sp.

Elongate parallel. Predominating color of elytra fulvous or reddish. Male with suture narrowly greenish, large spot just behind middle extending from suture almost to lateral margin green, occasionally with a very small greenish dot in center of elytra midway between suture and margin. Female with suture broadly green, usually with large spot in middle and another just behind the middle extending from suture almost to lateral margin green, often with one or more small greenish dots just behind humerus. Antennæ metallic, first segment from two to three times as long as the second. Eyes large and prominent. Head and pronotum bright metallic green, densely and coarsely punctate. Sides of pronotum (male) nearly parallel, slightly arcuate, (female) more arcuate and inflated basally. Elytra parallel, slightly sinuate behind base, tips bidentate. Beneath metallic green often with purplish reflection. Prosternum not sulcated, sparingly punctate in center, more densely so toward sides. First abdominal segment not sulcated, tips bisinuate to truncate with a small tooth on each side. Legs, sides of prosternum and abdomen covered with long silvery pubescence. Legs finely and moderately punctate, metallic except tarsi which are brownish. Male, length 11–13 mm., width 4 mm. Female, length 22 mm., width 7 mm.

Holotype (♂) in the Nicolay collection and one paratype (♂) in the Weiss collection. Allotype (♀) and one paratype (♀) in the Leng collection. Two paratypes (♀ ♂) in the Schaeffer collection. Tulare Co., So. California. Dilley (Miss F. Dennis) Oregon.

This species has long been placed in collections under the name *gibbsi*. How it was originally identified as this insect is a puzzle as there is not the slightest resemblance between it and Le Conte's description and figure (Report of Pacific Exploration, 1857, Plate I, fig. 17). It is distinct from all other members of the group and could never be mistaken for anything else. On oak (Van Dyke).

Buprestis gibbsi (Le Conte), 57–42.

Elongate parallel. Elytra purplish with anterior pale spot extending obliquely to the base and enveloping the humeral callus, another transverve spot just behind the middle not attaining the suture but extending to the margin and a subapical spot extending nearly to the suture and dilated along the margin; the last two spots always touched laterally with orange. Striæ deep, punctate, the intervals sparsely punctate. Antennæ testaceous, the first joint ænescent. Head purplish, punctate, the front carinate, base bisinuate. Pronotum more or less evidently impressed along the middle, sides parallel to slightly arcuate. Length 15 mm.

RECORDS.—Tulare County; Garberville, August (Chamberlin); Sonoma County (Rivers); Nevada City; Lake Ellann (Van Dyke); San Diego County (Coquillet); Palm Springs (Hubbard & Schwarz); Yosemite Valley, June 14, elev. 4000 to 5000 ft. (Mason); Sequoia Station, Tulare Co. (Hopping); CALIFORNIA. Corvallis (Chamberlin); OREGON. Manitou, July 6 (Neubarth); COLORADO. Steilacoom (Gibbs); WASHINGTON.

Not common, found occasionally on oak and poplar and probably breeds in these trees (Chamberlin). On black oak and black cottonwood (Burke). The above description was copied from Casey's translation of Le Conte with slight alterations and additions. *Gibbsi* is practically unknown in eastern collections. However Mr. Frank Mason of Philadelphia is fortunate in possessing two females. This species can be readily distinguished by the purplish elytra and the yellowish posterior spots being touched with orange, a character that is not clearly brought out in Le Conte's description.

Buprestis connexa Horn, 75–148.

Elongate oval. Elytra brilliant green shading to blue along suture, lateral margins cupreous, elytral intervals moderately convex more so near suture, sparingly punctate. Antennæ dark blackish cupreous, first two segments purplish. Head and pronotum cupreous with more or less of a greenish luster, head densely and coarsely punctate, pronotum more distinctly punctate, not impressed at middle but with distinct median line, sides feebly arcuate, narrower in front. Ventral surface and legs brilliant cupreous with greenish reflections, densely but finely punctate. Length 15 mm.

RECORDS.—Blue Mts., August 6, on yellow pine (Chamberlin); OREGON. Northern California (Chamberlin); California (Horn Coll.); Donner Lake (Garnett); CALIFORNIA. NEVADA (Horn Coll.). IDAHO.

Never found in numbers; a specimen was found July 28 on the foliage of yellow pine and one embedded in pitch on end of a yellow pine log; another was taken on July 18 from the sapwood of yellow pine (*P. ponderosa*) fully mature and would have emerged in a few days; the gallery traversed the cambium for some distance, winding around in a very irregular way, then entered the sapwood to a depth of two inches; the pupal cell was just within the sapwood. (Chamberlin.) On jeffrey pine (*P. jeffreyi*) (Burke).

This is one of the rarest species of the genus, less than a dozen examples being known; all of these, including the type and series in the Horn collection, are remarkably constant in size and color. Mr. W. J. Chamberlin has been fortunate in collecting some half dozen specimens.

Buprestis fasciata (Fab.), 87–177.

sexmaculata Herbst, 01–163.
lherminieri Chevrolat, 38–68.
sexplagiata ♂ (Le Conte), 59–205.
fulgens Casey, 09–106.
fortunata Casey, 09–107.
saturata Casey, 09–114.

Above bright green to blue. Elytra (female) with yellow fascia behind the middle and a yellow spot between apex and fascia, also occasionally with a yellow discal spot before the fascia. Male with large oblong or oval discal yellowish spot just before the fascia and not quite attaining the base. Male is smaller, usually with a more cupreous shine and the elytra are uniformly darker green than in the female. Tips either bidentate or with only a sutural tooth, external angle being rounded. Striæ moderately strong, evenly and

closely punctate, intervals broad. Antennæ dark greenish black or bronzed. Head and pronotum closely and coarsely punctate, sides of pronotum sometimes almost parallel, often arcuate and slightly swollen at base. Ventral surface and legs bright cupreous to greenish or violaceous, densely punctate. Length 11 to 18 mm.

Records.—West Indies. Southern Pines, in lowlands, July to late August, very rare (Manee); Cranberry (Thomas); North Carolina. Clayton, 2000–3700 ft.; Georgia. Cobham; Virginia. Kentucky. Gloucester County, rare; New Jersey. Cataraugus County, July (Davis); Lake Minnewaska, July (Davis); Wilmington, July 6 (Shoemaker); Keene Valley, Essex County, July, August, September (Notman); Binghamton, Sept. (Ellsworth); New York. Endeavor, July 12 to 30 (Kirk) (Knull); State College, August 11 (Knull); Monroe County (Davis); Pocono Lake, July 10 (C. T. Greene); Crooked Creek, July 7; Pennsylvania. Maryland. Waterford; Monmouth (Frost); Maine. Whitehall, July 29 (Liljeblad); N. Muskegon, July 13 (Hill); Pentwater, July 18 (Liljeblad); Pequaming, August 8 (Hebard); Baraga County, August 21, July 27 (Hebard); Paw Paw Lake, July 18 (Liljeblad); Charity Island, July 18 (Andrews); Muskegon, July; Grand Beach, June; Marquette, June 28, common in washup (Sherman); Michigan. Brule River, Douglas County, August 16 (Stone); Keshena, July (A. Skinner); Wisconsin. Duluth (Doggett); Minnesota. Indiana. Cincinnati (Dury); Ohio. Toronto, Ont.; Shawbridge; Matane County, August (Winn); Charlevoix County, August (Lyman); Levis County (Fyles); Terrebonne County (Hausen); Montreal Is., July (Chagnon); Vaudreuil County (Desnochers); Quebec; Parry Sound, July; Kearney, Ont., July 26 (Van Duzee); Canada. Breeds in maple ? and poplar ? (Chamberlin).

This is an eastern species, local and not usually taken in numbers except along the shore of Lake Superior during the end of June. Dr. E. C. Van Dyke finds that *sexplagiata* is merely the male of *fasciata*. The males are rare in collections because they are taken only accidentally on shrubbery and bushes and sometimes in copula. The females can be taken on logs when they are ovipositing.

Buprestis fasciata var. **langi** (Mannerheim), 43–237.

ornata Walker, 66–324.
bistrinotata Casey, 09–108.
angusta Casey, 09–108.

callida Casey, 09–109.
fastidiosa Casey, 09–109.
mediocris Casey, 09–109.
crenata ♂ Casey, 09–110.
seditiosa Casey, 09–110.
leviceps Casey, 09–110.
depressa Casey, 09–111.
viridimicans Casey, 09–111.
incolumis Casey, 09–112.
oregona Casey, 09–112.
obliqua Casey, 09–113.
patruelis Casey, 09–113.
graminea Casey, 09–114.

Elongate parallel. Above bright green to golden or bluish, occasionally purplish. Elytra in female ranging in color from entirely immaculate to variously spotted with yellow. Male marked with three large pale spots. Elytral tips bidentate, or with only a sutural tooth, external angle being rounded. Striæ deeper, more densely punctate, intervals narrower, more convex and more sparingly punctate than in *fasciata*. Antennæ dark green or bronzed. Head and pronotum densely and coarsely punctate, sides of pronotum variable, arcuate to sinuate or parallel, usually impressed medially. Ventral surface and legs more finely punctate, greenish always with a more or less cupreous luster. Tip of abdomen variable, either broadly rounded or sinuate each side with angle slightly prominent or truncate. Length 15–19 mm.

RECORDS.—Quincy, June 10 (Radcliffe); Weed, August (Chamberlin); Tulare County; St. Helena, Napa County, June, July (Fuchs); McCloud, July 2 (Van Dyke); Santa Clara County; CALIFORNIA. Seattle, June 10 (Fernecke); Tacoma, July 1 (Fernecke); Port Townsend (Seaton); WASHINGTON. Cascade, June 31; Dilley; Corvallis, April 20 (Chamberlin); OREGON. Senator, in mts., July; ARIZONA. Manitou, June 28 (Skinner); Sierra Nevada; COLORADO. Atalanta; IDAHO. Gallinas Canon (Snow); Beulah (Cockerell) (Beyer); NEW MEXICO. MONTANA. So. DAKOTA. NEVADA. Wandamere, Salt Lake City, May 18 (Sasko); UTAH. Alberta (Schaeffer); Beaver Mouth, B. C., July 14; Golden, B. C., August; Victoria, B. C., July 17; Kamloops, B. C.; Manitoba; Sitkha, Stikino River, B. C.? (Hamilton); Vancouver Island; Telegraph Creek, B. C.; Hudson Bay; Beaverfoot Range, Rocky Mts.; Winnipeg (Bell); Beren's River, Man., August, Peachland, B. C., July; CANADA.

Dug from Douglas fir (Van Dyke). Probably breeds in yellow pine; often seen on bright green foliage of poplar and willow (Cham-

berlin). Although strictly a western variety, this has in common with others, a wide range from north to south. The pigment of the elytra is extremely variable and this together with the difference in size and situations of the elytra and thorax has unfortunately been the cause of the numerous new names recently erected by Casey. The same peculiarities in sexes exist here as in *fasciata*. The males of *fasciata* and *langi* are sometimes indistinguishable, but in the females, the difference in elytral sculpture and shine will readily separate the two.

List of Species.

Buprestis Linne, 60–408.

Ancylocheira Eschscholtz, 29–8.

Anoplis Kirby, 37–151.

B. aurulenta Linne, 67–661.
lauta (Le Conte), 54–17.
radians (Le Conte), 54–17.
villosa (Le Conte), 73–331.
æmula Casey, 09–121.
tacomæ Casey, 09–121.
nupta Casey, 09–121.
venusta Casey, 09–122.
prospera Casey, 09–122.
affinis Casey, 09–123.
adulans Casey, 09–123.

B. adjecta (Le Conte), 54–17.
brevis Casey, 09–117.
intricata Casey, 09–118.

B. sulcicollis (Le Conte), 59–208.
lateralis Casey, 09–119.

B. striata Fabricius, 75–267.
obscura Casey, 09–125.

v. impedita Say, 36–160.
canadensis Casey, 09–124.

B. apricans Herbst, 01–125.
nigricornis (Sturm), 26–105.
bosci Castelnau & Gory, 37–146.
cribripennis Casey, 09–127.

B. decora (Fabricius), 75–217.

B. salisburyensis (Herbst), 01–174.
ultramarina Say, 36–160.

B. maculativentris Say, 24–272.
scxnotata Castelnau & Gory, 37–129.
maculiventris G.&H., 69–1378.
lecontei Saunders, 71–40.

v. rusticorum (Kirby), 37–151.
paganorum (Kirby), 37–152.
acomana Casey, 09–100.
morosa Casey, 09–101.
fusca Casey, 09–101.
sublivida Casey, 09–102.
caliginosa Casey, 09–102.
nigricans Casey, 09–102.
lyrata Casey, 09–103.
adducta Casey, 09–103.

v. subornata (Le Conte), 59–208.
rubronotans Casey, 09–97.
adonea Casey, 09–97.
histrio Casey, 09–98.

punctiventris Casey, 09–99.
violescens Casey, 09–99.
B. maculipennis Gory, 40–119.
inconstans Melsheimer, 46–146.
deficiens Casey, 09–90.
fusiformis Casey, 09–91.
scripta Casey, 09–91.
reducta Casey, 09–92.
leporina Casey, 09–92.
B. lineata Fabricius, 75–217.
v. davisi nov. var.
B. nuttalli (Kirby), 37–152.
v. alternans (Le Conte), 59–207.
conicicauda Casey, 09–93.
diruptans Casey, 09–94.
contorta Casey, 09–94.
gravidula Casey, 09–95.
torva Casey, 09–95.
boulderensis Casey, 09–96.
v. consularis Gory, 40–120.
flavopicta Casey, 09–96.
B. læviventris (Le Conte), 57–43.
pugetana Casey, 09–94.
B. confluenta Say, 23–159.
confluens (Le Conte), 59–206.
tessellata Casey, 09–104.
B. rufipes (Olivier), 90–16.
virens ♀ Casey, 09–105.
elongata Casey, 09–105.
B. viridisuturalis nov. sp.
B. gibbsi (Le Conte), 57–42.
B. connexa Horn, 75–148.
B. fasciata (Fab.), 87–177.
sexmaculata Herbst, 01–163.
lherminieri Chevrolat, 38–68.
sexplagiata ♂ (Le Conte), 59–205.
fulgens Casey, 09–106.
fortunata Casey, 09–107.
saturata Casey, 09–114.
v. langi (Mannerheim), 43–237.
ornata Walker, 66–324.
bistrinotata Casey, 09–108.
angusta Casey, 09–108.
callida Casey, 09–109.
fastidiosa Casey, 09–109.
mediocris Casey, 09–109.
crenata ♂ Casey, 09–110.
seditiosa Casey, 09–110.
leviceps Casey, 09–110.
depressa Casey, 09–111.
viridimicans Casey, 09–111.
incolumis Casey, 09–112.
oregona Casey, 09–112.
obliqua Casey, 09–113.
patruelis Casey, 09–113.
graminea Casey, 09–114.

LIST OF THE NORTH AMERICAN FOSSIL SPECIES OF BUPRESTIS.[4]

B. florissantensis Wickham ... Florissant, Colo. (Bull. Mus. Comp. Zoöl., vol. LVIII, No. II, 1914).
B. saxigena Scudder ..... Nicola River, B. C. (Rept. Progr. Geol. Survey Can., 1877–8).
B. sepulta Scudder ..... Nicola River, B. C. (Rept. Progr. Geol. Survey Can., 1877–8).

[4] Kindly furnished by Prof. H. F. Wickham.

B. scudderi Wickham .....Florissant, Colo. (Bull. Mus. Comp. Zoöl., vol. LVIII, No. II, 1914).

B. tertiaria Scudder .....Nicola River, B. C. (Rept. Progr. Geol. Survey Can., 1877–8).

Additional Notes.

Viridula Oliv., 90–27, is a Philippine species placed in the genus *Hoplotrinchus* by Kerremans.

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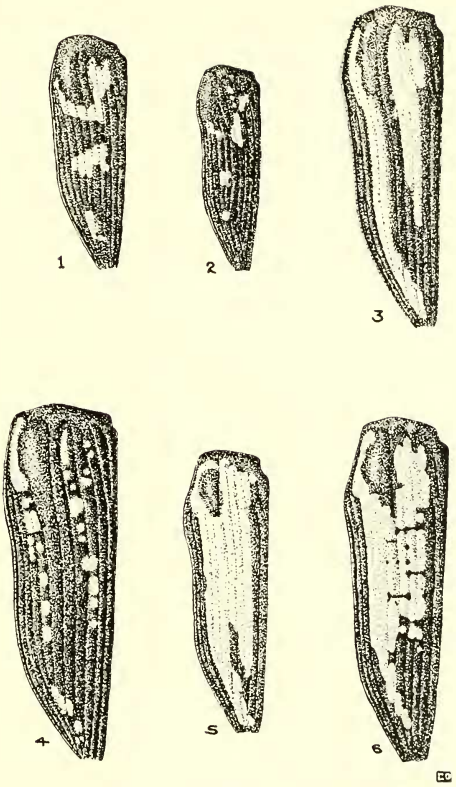

Buprestis.